June 28, 1966 S. T. STOOTHOFF 3,258,264

SHEET HANDLING APPARATUS

Filed Oct. 14, 1963 2 Sheets-Sheet 1

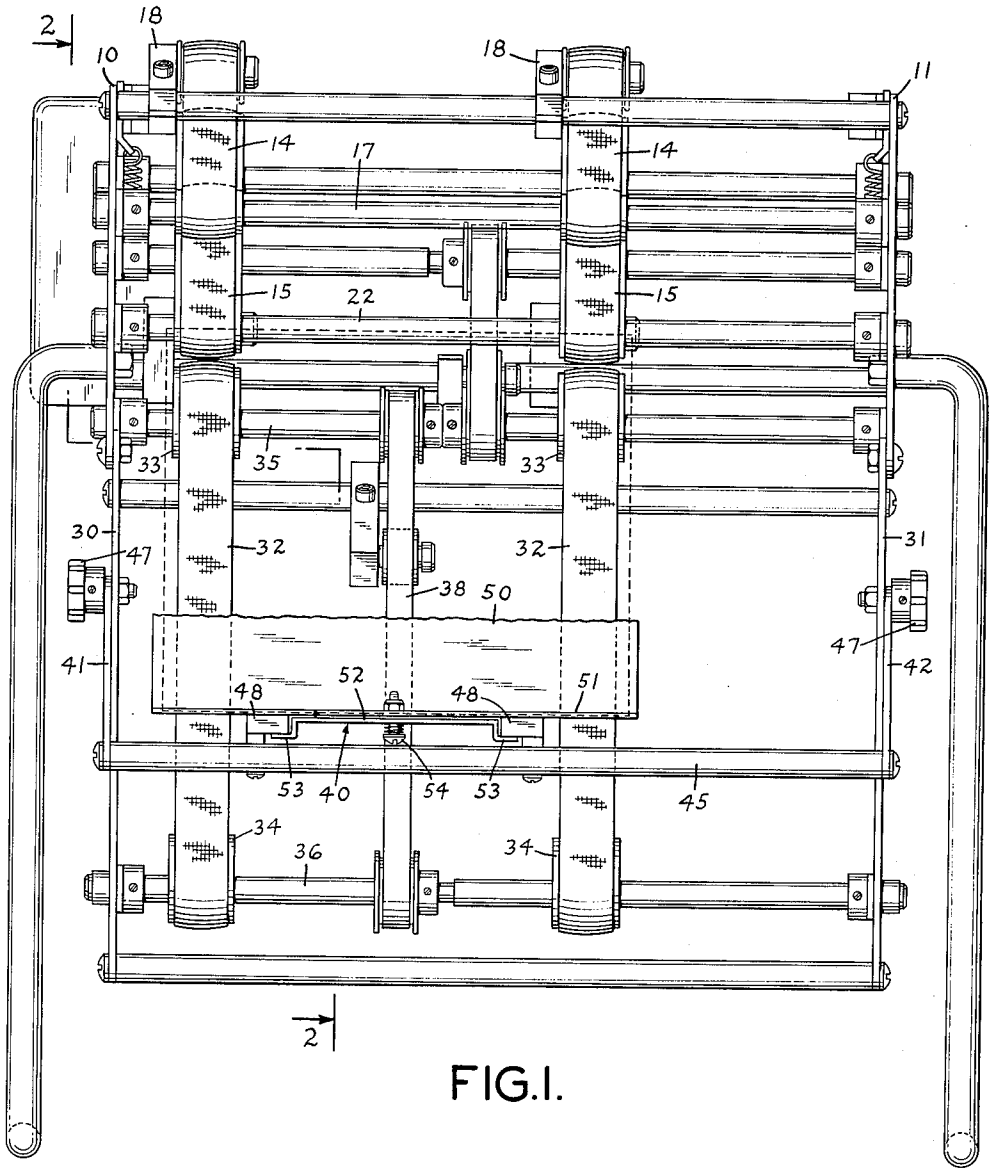



FIG.I.

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FIG. 2.

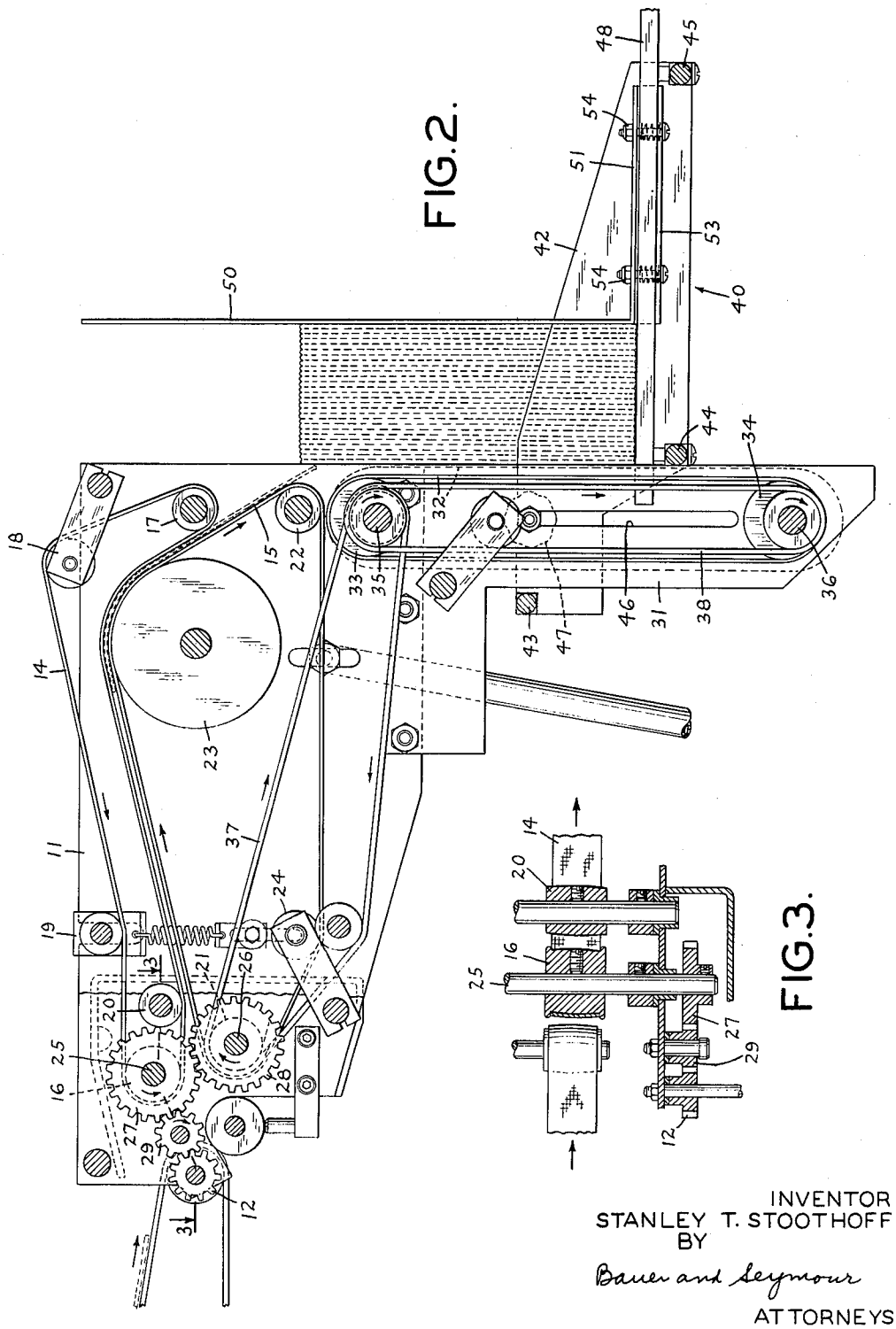



FIG. 3.




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# SHEET HANDLING APPARATUS

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15 Claims. (Cl. 271—68)

This invention relates to a sheet handling apparatus and more particularly to means for continuously stacking sheets on a sheet receiving means.

In the operation of a blueprint folding apparatus it has been found desirable to stack a plurality of folded blueprints on one edge and to form a horizontally extending stack of prints. In the continuous formation of the folded blueprints it has been found desirable to retain the stack of blueprints in a vertical position while at the same time continuously adding blueprints to the stack. It has also been found desirable to compress the stack of previously fed blueprints to form a compact stack. It is therefore an object of this invention to provide an improved apparatus for continuously forming a stack of sheets.

Another object of the invention is to provide a sheet stacking device wherein sheets are continuously fed to the previously stacked sheets.

Another object of the invention is to provide a sheet stacking device wherein the previously stacked sheets are compressed.

Another object of the invention is to provide a device for continuously stacking sheets and maintaining the stacked sheets in a vertical plane.

A still further object of the invention is to provide a device for stacking sheets and for simultaneously compressing the previously stacked sheets.

These and other objects will become more apparent from the following detailed description of a specific embodiment of the invention when read in conjunction with the accompanying drawings in which;

FIG. 1 is an end elevational view of a sheet handling apparatus embodying the invention;

FIG. 2 is a side elevational view taken along line 2—2 of FIG. 1, with certain parts cut away for purposes of clearer illustration; and

FIG. 3 is an enlarged top plan view taken along line 3—3 of FIG. 2 and showing the driving means for the feed tapes.

This invention is described and illustrated as being associated with a blueprint folding apparatus and as stacking folded blueprints. However, it is to be expressly understood that the novel sheet stacking apparatus disclosed herein can be utilized to handle various forms and shapes of materials such as signatures or unfolded sheets.

Referring now to the drawings, and particularly to FIGS. 1 and 2, the stacking means is shown as comprising a pair of side plates **10** and **11** secured at one end by conventional means to the discharge end of a sheet folding apparatus or other sheet feeding or handling equipment. Sheets are fed from a folding apparatus (not shown) to a pair of spaced apart upper tapes **14** and a pair of spaced apart lower tapes **15**. Tapes **14**, **15** in turn feed sheets to the stacking apparatus. Each upper tape **14** passes over a driven pulley **16**, an outer idler pulley **17** and adjustable tape tightening rollers **18**, **19** and **20**. Each



lower tape **15** passes over a driven pulley **21**, an outer idler pullely **22**, a large idler pulley **23** and a tape tightening pulley **24**. The driven pulleys **16** are secured to a shaft **25** having its ends mounted in suitable bearings in the side plates **10** and **11** and the driven pulleys **21** are secured to a shaft **26** also having its ends mounted in suitable bearings in the side plates **10** and **11**. A gear **27** mounted at one end of shaft **25** meshes with a gear **28** mounted to the end of shaft **26** so that the tapes **14** and **15** are driven at the same speed. An idler gear **29** engages gear **27** and gear **12**. Gear **12** is driven by either an independent source of power (not shown) or from the drive means of a folding machine or other apparatus to which the stacking machine is attached. A pair of downwardly extending plates **30** and **31** are secured to one end of the plates **10** and **11**, respectively. A pair of feed belts **32** are moutned over upper and lower eccentrically mounted pulleys **33**, **34**. The upper pulleys **33** are secured to a shaft **35** which has its ends mounted in suitable bearings in plates **10** and **11**. The pulleys **34** are secured to a shaft **36** which has its ends mounted in suitable bearings in plates **30** and **31**. The belts **32** are thus mounted in a substantially vertical position and because they extend over eccentrically mounted pulleys they are moved in an elliptical path upon rotaion of shafts **35** and **36** in a clockwise direction, as viewed in FIG. 2. The shaft **35** is driven from shaft **26** by means of a timing belt **37**. Shaft **36** is driven from shaft **35** by means of a timing belt **38**. Thus both shafts **35** and **36** are positively driven at the same speed. A sheet stacking means **40** comprises a pair of side plates **41** and **42** which are held in spaced apart relationship by spreader bars **43**, **44** and **45**. The sheet stacking means is positioned in front of and below the discharge end of the feed tapes **14** and **15** and the plates **41** and **42** extend perpendicular to the downwardly extending plates **30** and **31**. The plates **41** and **42** are selectively positioned at various horizontal levels by means of a slot **46** in each of the downwardly extending plates **30** and **31**. A nut and bolt combination **47** extends through one end of each of the side plates **41** and **42** and through the slot **46** in the respective plates **30** and **31** so that the horizontal level at which the plates **40** and **41** are retained may be selectivley determined. The spreader bars **43** and **44** are positioned from each other a distance equal to the width of the downwardly extending plates **30** and **31** so that such plates extend between the spreader bars to provide a secure anchor for plates **41** and **42**. A pair of spaced apart rail members **48** extend between the transverse spreader bars **44** and **45** and form a support for the stack of fed sheets. The rails **48** are of such a length that they extend inwardly between the forward edge of the plates **30** and **31** and between the feed belts **32** so that the fed sheets engage the rails. A transversely extending stack propping plate **50** having a generally L-shaped base **51** extends between the rails **48**. A U-shaped guide member **52** has outwardly extending fingers **53** at each end which engage the lower surfaces of each of the rails **48**. The guide **52** is secured to the base **51** of the stack propping plate by means of a spring loaded nut and bolt **54**. The stack propping plate **50** is thus slidably movable on the rails **48** and the amount of pressure required to slide the plate on the rails is determined by the tension applied to the spring loaded nut and

bolt 54. It is possible to replace the spring loaded nut and bolt 54 and the U-shaped clamp 52 by a pulley and weight combination to urge the plate 50 toward the feed belts 32 under a predetermined pressure.

In operation, sheets are fed through the belts 14 and 15 into a generally downwardly extending path toward the support rails 48 and between the previously fed sheets and the feed belts 32. As described above, the feed belts 32 move in an eccentric path toward and away from the stack propping plate 50. The operation of the timing belts is so arranged that as a sheet is fed from the belts 14 and 15 the feed belts 32 are in their position furthest away from the plate 50 and starting their approach toward the plate. As each sheet is fed from between the tapes 14 and 15 it is engaged by the downwardly and forwardly moving belts 32 which drive it downwardly until its lower edge contacts the rails 48 and at the same time the downwardly moving sheet and all of the prior sheets which have been stacked on the rails 48 are compressed between belts 32 and the plate 50. At about the same time that the forward end of said sheet engages the rails 48 the belts 32 move away from the plate 50 thus relieving the pressure on the stack preparatory to receiving the next fed sheet. The amount of tension on the nut and bolt 54 is adjusted to permit the plate 50 to yield slightly under the pressure of the advancing belts 32 but at the same time to permit a compression of the stack of sheets between belts 32 and the plate 50.

While there has been disclosed a specific embodiment of the invention, it is to be understood that this is the preferred form exemplary of the principles of the invention, and that the invention may be constructed in a variety of modifications and arrangements without departing from the true spirit and scope thereof. Accordingly, it is to be understood that the invention is not limited by the specific structure disclosed but only by the appended claims.

What is claimed is:

1. An apparatus for stacking sheets comprising means for supporting a stack of sheets on edge, stack propping means slidably mounted on said supporting means, means to feed a plurality of sheets edgewise one after another toward said supporting means, and means to engage each fed sheet and to move the same into engagement with said supporting means and to move each said sheet toward said stack propping means, said sheet engaging and moving means comprising a pair of pulleys each eccentrically mounted with respect to its axis of rotation, an endless belt mounted on said pulleys to run adjacent the end of said stack and means for driving said pulleys and belt, whereby said belt is intermittently moved into and out of engagement with each fed sheet.

2. In an apparatus for stacking sheets the combination of means for supporting a stack of sheets on edge, means to feed sheets one after the other edgewise toward said supporting means, and means to engage a broad surface of each fed sheet and to move one edge thereof into engagement with said supporting means and to compress each said fed sheet against the stack of previously fed sheets on said supporting means, said sheet engaging and moving means comprising a pair of eccentrically mounted pulleys, means for driving said pulleys about their axes of rotation and an endless belt mounted on said pulleys and having one reach thereof adjacent and generally parallel to an end of said stack whereby said belt is intermittently moved into and out of engagement with each fed sheet.

3. In a sheet stacking apparatus the combination of a base member for receiving a stack of sheets on edge, a stack back-up support slidably mounted to said base for retaining said sheets in a stacked on edge relationship to each other, and means to feed successive sheets into engagement with said base member while retaining said previously fed sheets in stacked relationship to each other, said last-named means comprising a pair of pulleys, means for driving at least one of said pulleys on an axis and an endless belt mounted on said pulleys, at least one of said pulleys being mounted eccentrically relative to its axis of rotation to move said belt into and out of engagement with the said receiving end of said stack whereby said stack and back-up support are intermittently moved to provide space for incoming sheets.



4. Sheet stacking apparatus comprising means for supporting a stack of sheets on edge for movement endwise of the stack, means for feeding sheets edgewise into registry and engagement with the trailing end of said stack, means at the leading end of said stack for holding the sheets at said leading end in on-edge position and for yieldably resisting movement of the stack in a forward direction, and actuating means for intermittently moving said stack and said holding means in said forward direction along said stack supporting means as sheets are fed to the trailing end of the stack, said actuating means comprising a pair of pulleys, means for driving at least one of said pulleys about an axis and an endless belt mounted over said pulleys and having one reach thereof extending in a generally vertical direction adjacent the trailing end of the stack, at least one of said pulleys being mounted eccentrically relative to its axis of rotation to move said belt into and out of engagement with the trailing end of said sack and thereby move the stack forwardly as additional sheets are fed to the stack.

5. Sheet stacking apparatus as defined in claim 4 wherein said one reach of the belt is driven downwardly to promote the in-feeding of sheets between said reach and said stack.

6. Sheet stacking apparatus as defined in claim 4 wherein the axes of rotation of said pulleys are fixed.

7. Sheet stacking apparatus as defined in claim 4 wherein both pulleys of said pair are eccentrically mounted relative to their respective axes of rotation and said reach of the belt nearest the stack runs substantially parallel to the broad surface of the trailing end of the stack.

8. Sheet stacking apparatus comprising means for supporting a stack of sheet on edge for movement endwise of the stack, means for feeding sheets edgewise into registry and engagement with the trailing end of said stack, means at the leading end of said stack for holding the sheets at said leading end in an on-edge position and for yieldably resisting movement of the stack in a forward direction without exerting a positive force tending to move the stack in a rearward direction, friction means constituting the sole means for resisting movement of said holding means in said forward and rearward directions, and actuating means for intermittently moving said stack and said holding means in said forward direction along said stack supporting means as sheets are fed to the trailing end of the stack by said sheet-feeding means.

9. Sheet stacking apparatus as defined in claim 8 comprising means for adjusting said stack supporting means vertically relative to said actuating means.

10. Sheet stacking apparatus as defined in claim 8 wherein said actuating means comprises a pair of pulleys, means for driving at least one of said pulleys and an endless belt mounted on said pulleys, at least one of said pulleys being mounted eccentrically relative to its axis of rotation to move said belt into and out of engagement with the trailing end of said stack to thereby move the latter forwardly as sheets are fed to the trailing end of the stack.

11. Sheet stacking apparatus as defined in claim 10 wherein one reach of said belt adjacent the stack extends in a generally vertical direction and said sheet-feeding means feeds the sheets downwardly between said reach of the belt and the trailing end of the stack.

12. Sheet stacking apparatus as defined in claim 10 wherein one said pulley is vertically disposed relative to the other pulley of said pair and said endless belt is

so driven by the pulleys that the reach thereof nearest the stack runs downwardly to aid the in-feeding of the sheets.

13. Sheet stacking apparatus as defined in claim 12 comprising stop means engageable by the lower edges of the sheets for limiting downward movement thereof as the same are fed to the trailing end of the stack by said sheet-feeding means.

14. Sheet stacking apparatus as defined in claim 8 wherein said friction means comprises stationary means supporting said holding means for linear movement in the direction of movement of said stack and resilient means urging said holding means into frictional engagement with said stationary means.



15. Sheet stacking apparatus as defined in claim 14 wherein said holding means comprises a vertically extending portion engaging the leading end of the stack and a horizontally extending portion in frictional engagement with the stationary supporting means therefor.

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